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MANPOWER STRUCTURE, EDUCATIONAL REQUIREMENTS AND ECONOMIC DEVELOPMENT NEEDS*

Document prepared jointly by the ECLA secretariat and UNESCO

* This document presents a summary of some of the problems which will be considered in greater detail in a major study now under preparation.

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INTRODUCTION

EDUCATION AND ECONOMIC AND SOCIAL DEVELOPMENT

1. The fact that education is one of the basic requirements for economic and social growth has been effectively recognized in the last few decades and is generally accepted now by those concerned with the study and implementation of plans for national development. The interrelation of education with the other factors of economic and social development needs, however, further investigation both theoretically and from the point of view of concrete situations; further advance in this field is indispensable to make the best use of human resources in the process of achieving social integration and raising the level of productivity and the standards of living. It is also indispensable for the establishment of a proper methodology of manpower assessment and educational planning within the framework of economic and social planning.

2. Education has naturally its own ends, related to the preservation and enrichment of the central heritage and the human tradition, the full development of personality, individual, national and international values and aspirations. The analysis and determination of these ends are clearly outside the scope of economic investigation and belong rather to the fields of psychology, sociology and philosophy.

3. The subject of discussion in this paper is therefore limited to some aspects of education which have a direct bearing upon economic and social development, and which may therefore be considered as educational requirements for over-all development and, particularly, for manpower assessment.

4. The analysis of the educational requirements for economic and social development is complex because of the variety of influences which education exercises upon the economic and social system, of which it is a part. Some aspects of educational structure and activity directly affect the economy; some act in more general ways, while others, at least in the short run, may not be relevant for economic development.

/Consequently a

5. Consequently, a distinction should be made between what can be called direct educational requirements, e.g. those representing direct inputs into the training of manpower with desired qualifications, or even the fostering of certain attitudes towards production and consumption, and general educational requirements, corresponding to the other aspects of education related to over-all human, cultural and social development and which may therefore either facilitate or hinder economic and social growth.

6. Direct educational requirements, though very complex and subject to continous alterations, may become measurable with a certain degree of approximation in quantitative and qualitative terms, at least for certain sectors, which makes it possible to determine the corresponding educational targets. The evaluation of this type of educational requirements greatly facilitates the integration of educational planning with over-all social and economic planning.

7. General educational requirements, on the other hand, correspond to the needs of raising the general cultural and educational level of the community, in order to enable it easily to adjust, both collectively and through individual action, to the changing conditions inherent in economic and social progress and to create the modern institutional framework which would allow for the highest possible efficiency in the use of available capital and human resources.

I. MANPOWER ANALYSIS AND STRUCTURAL CHANGES RELATED TO ECONOMIC DEVELOPMENT

8. Analysis of the structure of manpower requires, as a first step, systematization of the principal concepts which determine the characteristics of the labour force. These characteristics refer to the following problems:

(a) the training level;
(b) the professional field of specialized training received;
(c) the type of function performed in practical life;
(d) the actual occupation;
(e) the branch of activity.

It is upon such a general basis that more specific classification

/criteria corresponding

criteria corresponding to the necessities of manpower and economic analysis and planning should be discussed. The proposals outlined below would represent a consistent methodological approach to skilled manpower problems, to be dealt with in qualitative as well as quantitative terms.

9. Full professional training is composed of four distinct stages, representing different types of training: (1) general education; (2) professional education; (3) professional specialization; (4) occupational specialization. Stages 1, 2 and 4 are normally separated in time and might be analysed and classified independently. Stage 3 is partially concurrent with state 2, and can also be extended into stage 4, when practical on-the-job training and further professional specialization through formal instruction may be carried on independently. In the training of personnel at lower levels, stages 2 and 3, corresponding to formal professional training, are either limited or non-existent.

10. On the basis of the normal length of general and professional training, adding the specific capacity acquired through practice, main skill levels might be established. Apart from the typical length of the periods corresponding to the process of general and professional education involved, a fundamental criterion for the standardization of the main training levels is the elimination of excessive gaps between each consecutive level. This can facilitate professional promotion from one step to another without falling into the opposite error of an excessive number of professional categories, making the definition of each training level virtually meaningless. (To facilitate further discussion, this may be referred to as problem (a) in point 8.)

11. Considering the aggregate length of general and professional education and the kind and intensity of practical training received during or after the completion of formal education, at least six main training levels may be distinguished, as illustrated in Chart I. These levels provide only a schematic framework for a more detailed analysis of professional levels of the working force. Each of the main training levels may be subdivided

/further into

further into various specific level-categories. There is good reason to believe that the number of main training levels specified here represents the minimum that can be considered. A smaller number of training levels runs the risk of serious over-simplification and to this extent cannot serve as an adequate basis for the comprehensive treatment of the problem under consideration.

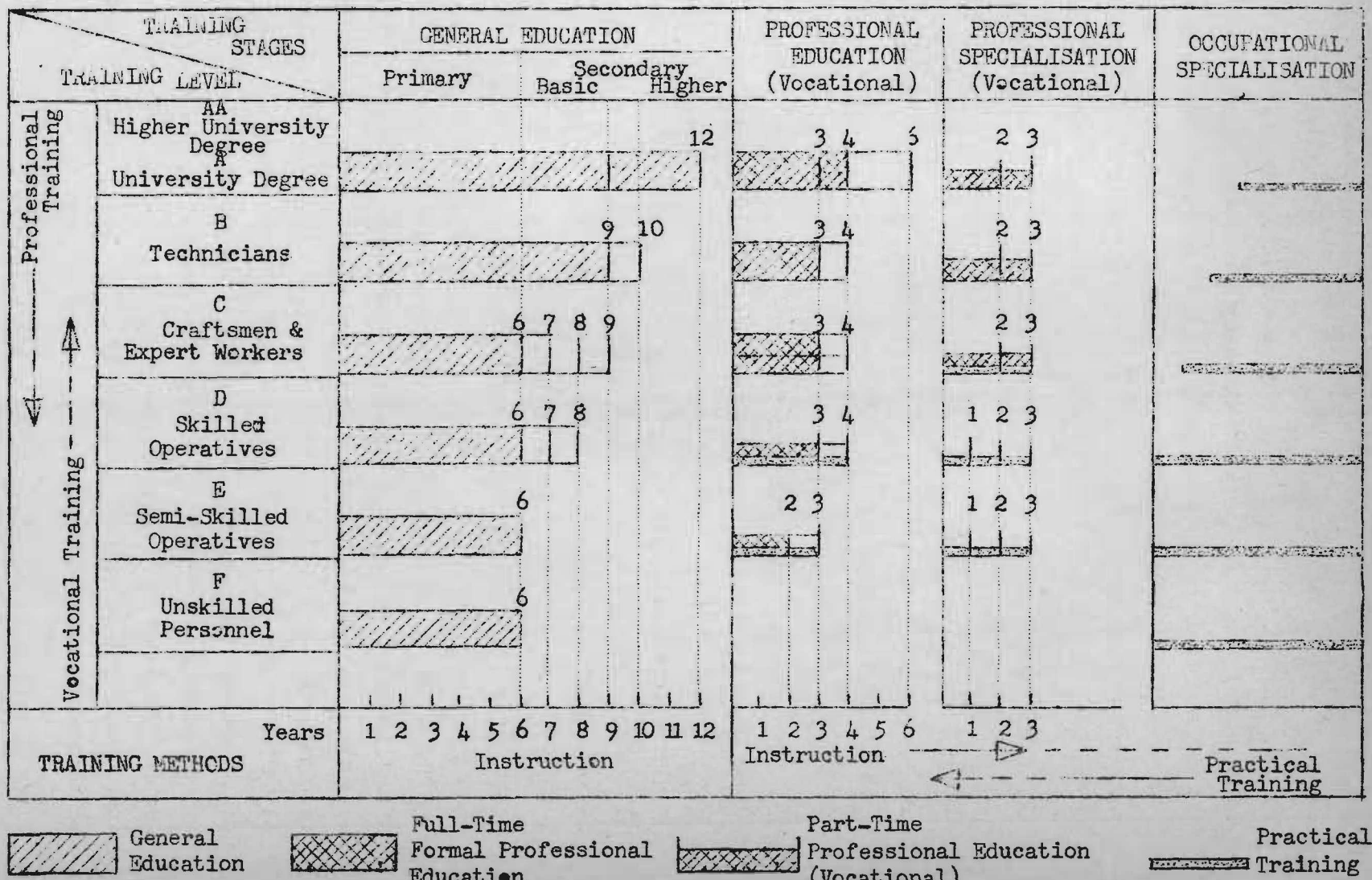
12. Within each training level, distinct types of basic professional training result in the creation of a limited number of "professions" (problem (b) in point 8). The formation of "professionals" is, in that sense, an educational as well as an economic phenomenon, having its economic implications with a degree of flexibility relevant to economic and occupational changes, and its specific cost of production.

13. The nature of economic activity today is such that industry and most of the other economic sectors require an increasingly systematic training of the labour force, including medium-grade operatives. The functions performed by manual workers, although relatively simple, become increasingly responsible because of the costly equipment and intricate production methods involved, and consequently the training of these workers requires a fairly good educational basis to permit adequate understanding of modern technologies. This obviously cannot be acquired through practice alone, and calls for systematic schooling in the relevant subjects. In this way the introduction of the elements of genuine "professional" formal education, though not necessarily on a high level, means abandoning the traditional approach to the manual labour force as an amorphous mass of workers receiving training of a strictly operative type; thus "professionalization" of an increasing proportion of the labour force becomes an integral part of socio-economic progress. At the same time the concept of "professionals", which formerly was confined to university graduates, loses this narrow meaning and takes on a much broader one, including all who receive formal instruction in the various professions on the basis of an adequate general education.

/ 14. All

Chart .I

PROFESSIONAL AND VOCATIONAL TRAINING



14. All professions are grouped into "broad professional fields". The greatest number of professional fields may be distinguished at the highest training levels. Such fields are: science (including natural science), agronomy, technology, medicine, administration and commerce, economics, law, social science and humanities, and art. At the lower levels the number of professional fields tends to be reduced to those professions which may be handled with only a little theoretical preparation. Agriculture, technology, art and commerce may be practised at lower levels by persons having distinctly professional types of training.

15. In relation to manpower planning, a certain number of professions must be specified and their special characteristics determined. The number of major professions that can be distinguished within the economy consists of about one hundred categories. The major professional categories are in turn sub-divided into numerous professional specializations. A limited number of the latter are distinguished by the fact that they call for the mastering of a significantly large and specialized body of theoretical and practical knowledge, over and above that required for the major professions. This type of extensive training yields what might be called "main specialization" categories. This distinction within the various types of major professional categories should be considered separately in the planning of professional education.

16. Professionals, as well as lower categories of personnel, usually perform certain typical functions, for which a standard specification should be established (problem (c) in point 8.). It may be estimated that a total of not more than twenty concepts would be sufficient in this connexion. The main types of activity in which the higher level professional categories are engaged may be indicated, more or less precisely, by the following functional categories:1/ research and development; field exploration; designing and drafting; testing, inspection and laboratory service;

1/ Adopted from the classification used in Canada by the Economic and Research Branch, Department of Labour, Ottawa, Ontario. Canada.

/construction, installation

construction, installation, erection; production, operation, maintenance; technical supervision; individual practice and consulting; teaching, instruction and extension work; purchasing and marketing, sales and service; administration and management; miscellaneous (cost accounting, etc.). Personnel included in the lower professional training levels or those classified as manual labour perform a variety of functions which are more limited in number than those enumerated above. Typical among the functions that are almost exclusively performed by the lower training level groups are the following: craftsmen; process operations, corresponding to narrowly defined and repetitive work; and equipment operations, where the work is orientated to the machine rather than the process or product as in the previous category.

17. It is to be noted that in the performance of some of the functions indicated above what is involved is the undertaking of a typical technical duty belonging to a given profession. The functions of research, designing, testing, production, supervision and professional consulting are examples of this type. There are, however, some functions whose performance means entering into various fields entirely different from the nature of the basic profession. Typical cases are management and higher level administration, teaching, purchasing and selling, or highly complex equipment operation. From the standpoint of training, these cases of functional specialization have a significance similar to main professional specialization.

18. The concept of occupations (problem (d) in point 8) is much more specific, entering into greater details than the general concepts of functions and professions. In some cases actual occupations are not separately identifiable from the characteristics of professions and functions under pblems (b) and (c). Occupations in real life are closely related to specific economic and technological processes. Occupations may be defined, therefore, as the performance by persons with a given basic preparation, which may be of a professional or non-professional kind, of certain typical functions, with respect to some definite economic processes, and involving still more specific technical operations. Consequently, the clasification of occupations may be connected with the classfication processes, within a process analysis system which can now be developed.

/19. Manpower

19. Manpower classification by economic activities (problem (e) in point 8) is one of the principal tools of skilled manpower planning, since projections of specific economic activities become principal terms of reference for estimating the necessities in the various professional-functional categories of personnel. When, however, economic activities are broken down into single economic processes, classification by activities may become closely related to occupational classification.

20. A manpower classification system, the most important purpose of which is to facilitate the planning of the use and supply of specific categories of skilled manpower, should be based in the first instance upon concepts referring to manpower categories of a fundamental and durable nature, and only secondly upon concepts subject to easy and rapid changes. The classification criteria quoted under (a), (b),(c) and (d) in point 8 should be discussed specifically in connexion with manpower classification, with a view to its adaptation to programming needs and other purposes enumerated below. Consequently, main professional-functional categories of manpower, linked with the main training levels, could provide the general framework of the classification system. The methodological problem would ultimately consist of determining the minimum sub division that would be adequate and consistent with the required training system.

21. The principal purposes for which manpower classification should be designed may be enumerated as follows:

(a) Determination of the general scale and pattern of economic and social development planning.

(b) Planning, organization, and evaluation of the human aspects of specific projects of economic and social development.

(c) Planning, organization and evaluation of long-term educational programmes.

(d) Planning, organization and evaluation of short-term vocational-training activities.

(e) Provision of vocational guidance and career information to those entering the employment market for the first time or seeking a change of employment.

/(f) Organization and

(f) Organization and operation of employment services.

(g) Introduction of objective criteria for social functionalization of the labour force through the extension and clarification of the notion of professions and functions.

(h) Introduction of criteria facilitating the rationalization of labour organizations by relating them more closely to the professional and functional structure of the labour force.

(i) Provision of a framework for the introduction of objective criteria for a rational wage and salary structure related to educational and training requirements and performance-orientated incentive systems.

(j) Provision of a framework for manpower productivity measurement and analysis.

(k) Provision of a basis for scientific methods of personnel administration and management.

22. The introduction of training levels corresponding to specific categories of the working force and related to the length and intensity of training, makes it possible for the national labour force as a whole, or the working force in any sector of the economy, or even in a single establishment, to be presented in the form of a labour force "profile", as shown in Chart II.

All the specific skill categories into which the labour force is sub-divided, may be presented in the form of a series of columns based on the X-axis. The width of the column represents the relative proportion that the given category of personnel bears to the total labour force. The average training level of each skill category is measured along the Y-axis. If the columns of skilled labour categories are arranged in descending order of training level the profile takes the form of a series of steps moving downward from left to right. The discontinuous profile may be smoothed to yield a continuous curve sloping downward to the right. The latter is a generalized graphical presentation of the labour force profile.

23. There are three basic elements of the profile which, from the standpoint of skilled manpower analysis are of outstanding importance. These are: (i) the weighted average of the profile, or in other words the average training level of the working force; (ii) the configuration of the

/CHART II

CHART II

TYPICAL LABOUR-FORCE PROFILES

Figure 1

The case of an under-developed country

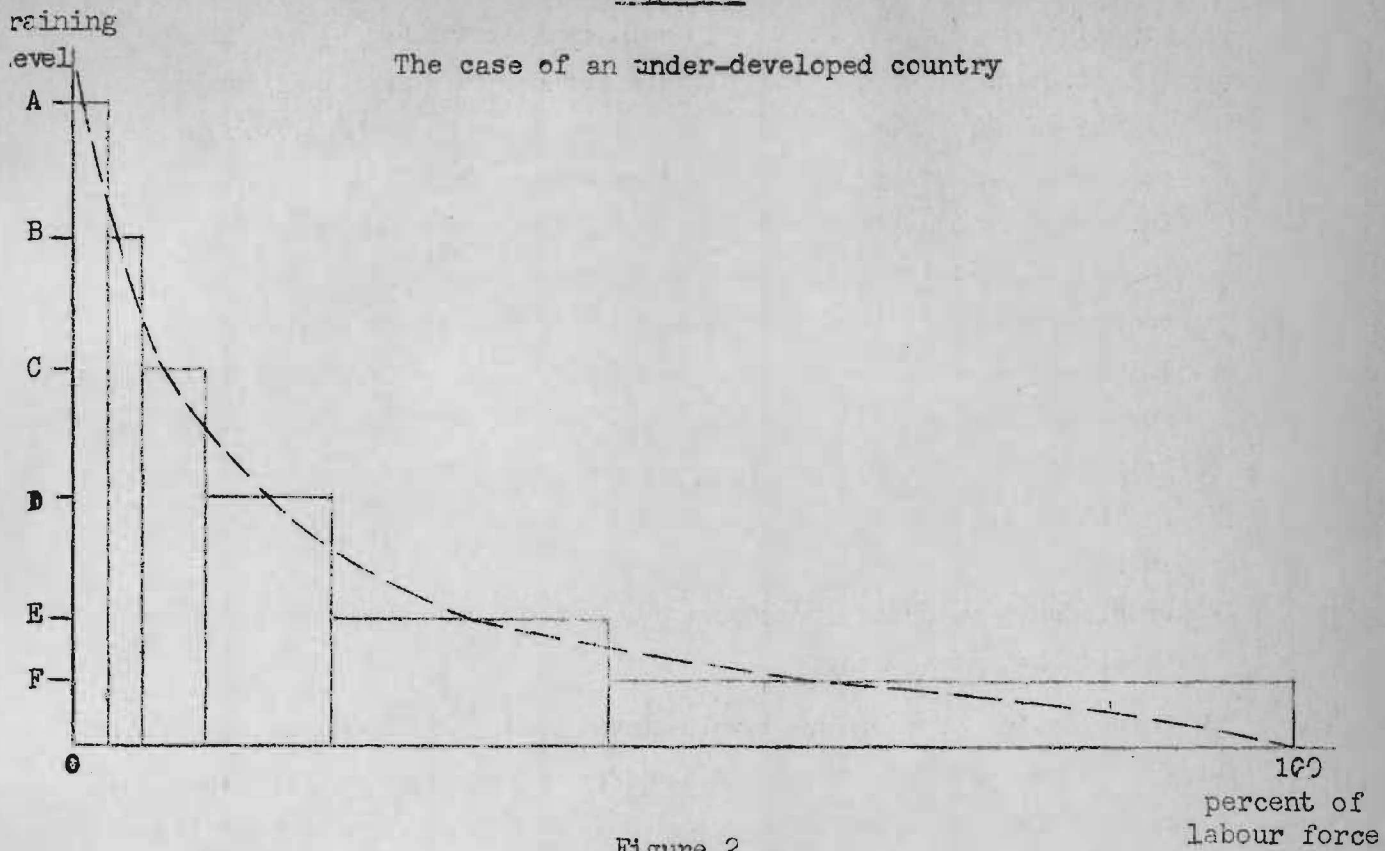
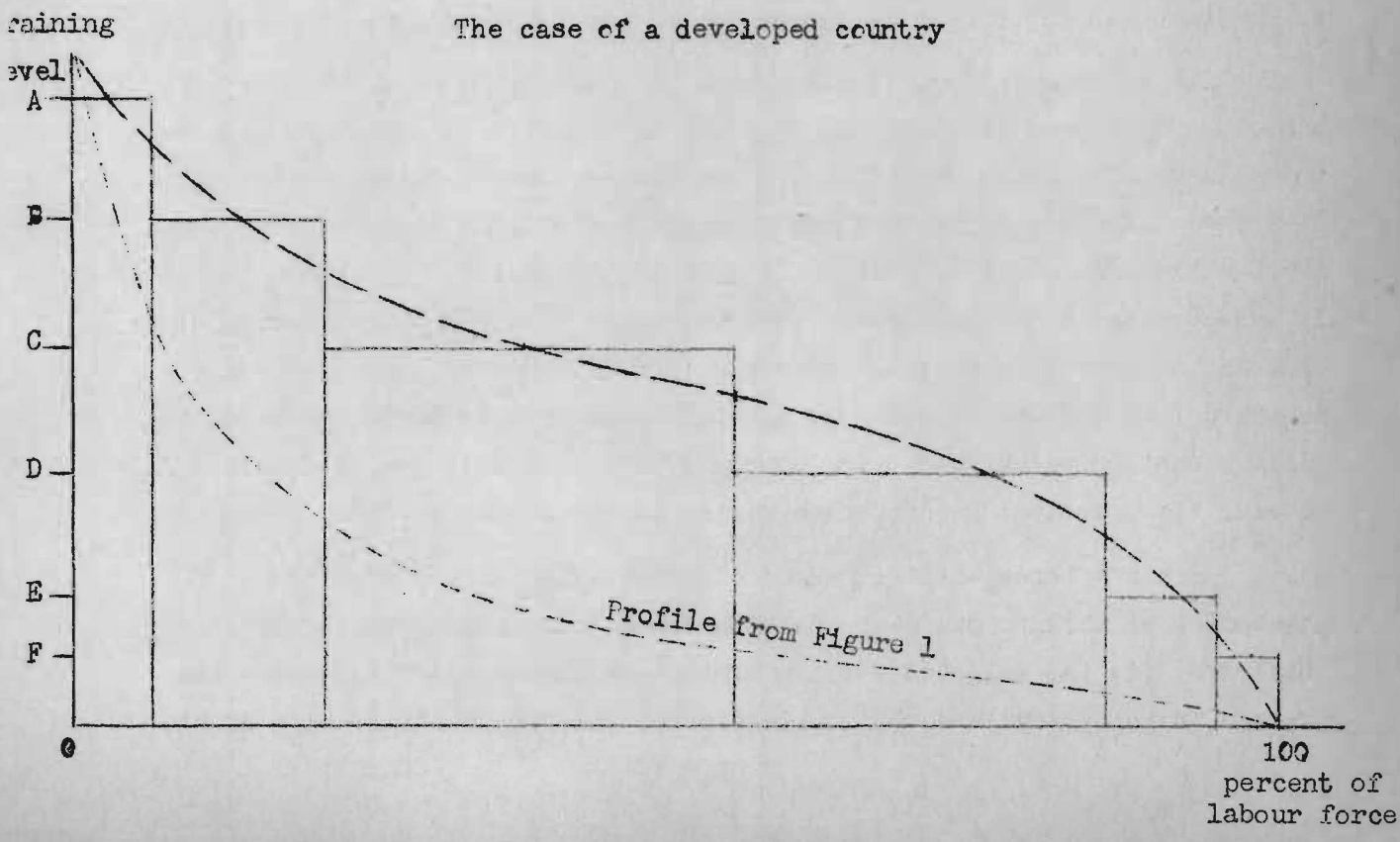


Figure 2

The case of a developed country



profile reflecting the degree of continuity among the various training levels; and (iii) the professional composition of the working force covered in the profile.

24. The flexibility of the labour force structure is a fundamental requirement stemming from the necessity of rapid adjustments of functions and skills of available personnel to the varied and continuous changes taking place within the economy, especially when a general scarcity of skilled personnel makes these adjustments more imperative. When planning the manpower structure and determining the minimum qualifications of its component elements, the importance of flexibility should be continuously kept in the forefront of the programme.

25. The principal factors contributing to flexibility in manpower composition are embodied in the general educational level of man-power or more precisely, in the weighted average of the educational profile of the labour force, the shape of the profile, and the characteristics of the professional composition. An additional factor of adaptability is to be found in the syllabus and the quality of teaching of specific key subjects forming the general educational basis in broad professional fields. Teaching of basic principles of mathematics, physics, chemistry, organization, accountancy, economics, logics, language, designing and drafting belongs to this category.

26. The typical changes in manpower structure following economic development and general progress correspond to employment shifts between: (a) different economic activities (which may be called inter-sectoral changes; (b) changes within branches of economic activities (intra-sectoral); (c) changes in the occupational structure of individual establishments and enterprises. These changes involve a profound transformation of the categories of occupations, and of specific occupational characteristics, generally requiring additional knowledge and experience.

27. The broad characteristics of inter-sectoral changes related to economic development are, first of all, transformations corresponding to the shifts of rural population to towns and the process of industrialization. These shifts by themselves produce a rapid expansion of demand for workers in

occupations requiring higher education and training, accompanied by a relative contraction of simpler occupations. Other typical shifts, taking place in the urban areas themselves, are shifts of manpower from simpler and less productive to more complex and highly productive occupations. Among these may be noted the contraction of homecrafts and handicrafts in relation to factory industry, and within manufacturing industry the more rapid development of the so-called "dynamic industries". The latter are usually more complex than the traditional staple industries.

28. The accelerated expansion of towns in under-developed countries, where it is more rapid than the expansion of productive trades, gives rise to "marginal population", that is, a group of persons seeking occupations of the simplest kind and which do not require special preparation. This phenomenon, though strongly reflected in manpower statistics, is not a normal feature of the labour force but is rather pathological in nature. The prerequisite for its elimination is a shift of the relevant persons to more productive activities, which almost certainly requires a higher level of education and training.

29. Other changes stem from progress in the fields of technology, organization of production and distribution and management within the existing or newly created activities. These involve a greater diversification and specialization of functions, a higher capital-intensity of economic processes, and a wider and more extensive use of modern technologies and specialized equipment. All this implies a more extensive use of skilled labour and improvements in the training of employed personnel. This is true at least up to the point at which automation begins to reduce demand for skilled labour of the traditional kind, while on the other hand increasing the demand for highly skilled personnel to construct, install and maintain automatic equipment.

30. These changes in the manpower structure in Latin America, and the implication for education and training are similar in many respects to changes taking place in other under-developed areas or those observed in

/the past

the past in many of the economically advanced countries. Perhaps it is in the intensity and rapidity of such changes which can be observed for example, in the rate or urban growth in the region, that current changes in the manpower in Latin America call for special attention. The new plans aimed at accelerating Latin American economic and social development and associated with the formulae of liberalization of inter-American trade and the programme of the Alliance for Progress, make it more imperative than ever to secure the positive transformation of manpower structures through improvements in formal education and special training, with a view to higher productivity and better socio-economic organization and discipline.

II. DETERMINATION OF DIRECT EDUCATIONAL REQUIREMENTS IN RELATION TO THE LABOUR FORCE STRUCTURE

31. A thorough discussion of skilled manpower problems must ultimately embrace the underlying system of education and training. Clearly, each of the principal categories of skilled manpower is associated with a specific pattern of education and training. Thus the existing or the desired manpower structure may be expressed in terms of definable educational requirements. These requirements would have to be presented, in turn, in the form of a series of basic concepts related to the structure of general and professional education and training, and to training programmes that should be designed to meet clearly determined socio-economic objectives. Four basic postulates may be formulated in this regard:

(i) Each of the basic stages which constitutes professional and vocational training, as indicated in point 8, represents distinct types of training and is to be treated individually in the analysis and incorporated into educational planning.

(ii) The main professional-functional levels of the labour force should determine corresponding standardized educational levels, irrespective of professions.

(iii) From the nature of the required professions, a limited number of basic training programmes built upon established educational levels should be introduced and standardized to the extent possible.

(iv) From the functional requirements related to type of occupation, specific programmes of professional-functional specialization should be introduced into the system of formal professional and vocational training, but without excessive specialization in view of the necessity of retaining sufficient flexibility.

32. Thus, it is particularly important, for effective programming, to define a minimum number of categories of the labour force required, in terms of numbers of persons and qualifications involved. It is upon such a basis

/that definite

that definite professional and vocational training programmes may be designed.

33. It is obvious that general educational requirements should be defined, taking into account two basic necessities: (i) the raising of the average educational level of the whole community, including the eradication of illiteracy; (ii) the building up of the appropiate educational profile of the population, along with the desired training profile of the labour force, taking into account the lapse of time in the transformation of the actual profiles into those desired.

34. Four principal structural and policy principles are relevant in this connexion:

(i) Six-year primary education should be given to everybody, thereby ensuring effective literacy and also providing some necessary cultural background, even to unskilled labour. In this way possibilities for promotion into the skilled categories of manpower are opened.

(ii) The extension of primary education, corresponding to the completion of the seventh and eighth grade, should be introduced, to serve as pre-training for higher manual skills, whose basic secondary education would not be pursued. The seventh and eighth grade of primary schools should also be considered as a preparation for vocational training and the syllabi should contain basic elements which facilitate further training.

(iii) Basic secondary education, covering a definite cycle of general education within a three or four-year programme of instruction, and based upon the completion of the six-year primary school, should be introduced and developed to make it accessible to all the more capable children completing primary education. Basic secondary education should provide an adequate background for a large number of students who could subsequently undertake higher secondary professional education. At the same time this level of education serves as a process of selection among adolescents - indicating those who might and those who might not have the capacity to pursue university studies.

/(iv) Higher

(iv) Higher secondary education should be established as a separate, superior cycle of secondary education, with its own clearly defined goals, aimed at preparing selected groups of capable persons for studies within definite professional fields in the universities and specialized high schools at university level. The essential purpose of higher secondary education is to prepare individuals for further studies at the university level. In addition, it should be required to perform the task of professional orientation, that is, to facilitate the choice of specific professional careers and at the same time the task of selecting those capable of continuing on to the university and diverting others to higher non-university types of professional schools.

35. Professional educational requirements refer to basic professional education, complemented by professional specialization either within the school system or outside it, in the form of practical occupational specialization. The latter is always to be viewed as an addition to basic professional knowledge. Professional education is much more complex than that of general education, and this is enhanced by the many variations in training levels and types of specialization. In view of these considerations, it is imperative to simplify and standardize the major problems involved in professional education in order to permit the systematic computation of the respective educational requirements. These could be used in educational planning within the framework of general economic planning.

36. The elements of a reasonable systematization and standardization of professional and vocational training should be derived from the main concepts of skilled manpower analysis, as developed in points 8 to 17 above, as well as the flexibility factor discussed in points 24 and 25. In this way, the integration of professional education into skilled manpower planning is provided with more rational foundations and is therefore more easily accomplished.

37. It is important that the main professional and vocational training levels should be well co-ordinated with the principal levels of general

education, since there exists a sequential relationship between the two. Within the main training levels, scope must be provided for educational requirements underlying a variety of specific professional training levels, corresponding to major and minor professions. Thus educational programmes could readily be harmonized with the desired shape and composition of the educational profile of the labour force.

38. Particularly relevant to Latin American circumstances is the development of higher secondary professional education, so as to furnish a corps of well-trained intermediate professional personnel. This skilled manpower group is indispensable for the efficient performance of higher-level professional personnel and for the enterprise in general. Moreover, scope is provided for capable and ambitious individuals to pursue professional studies at university levels.

39. The development of specialized professional training programmes should conform to the list of professions required or likely to be needed in the economy and, at the same time, should avoid introducing excessive specialization during the school period. The programmes, however, should take into account the main professional and equivalent functional specializations for which an adequate formal educational background should be provided, usually after graduation from secondary school.

40. Professional specialization should be related as much as possible to the various forms of practical training, during the school period or immediately after. For the highest professional education levels, it is often advisable to combine specialization with research. Practice programmes, research and technical assistance work of the universities and high schools not only enrich the syllabi but also provide a close link between the educational establishments and the economy and community life.

41. The requirements regarding adult education are primarily derived from those gaps in the professional and vocational training of the labour force that are impossible to fill by formal education or by the on-the-job training of adolescents. Adult education is often the most rapid and

/cheapest way

cheapest way to achieve certain objectives in the field of qualified manpower. On the other hand, it is a more limited procedure than the normal education of children and adolescents. Furthermore, it is extremely difficult to induce working adults to make additional efforts in respect of their studies. In this connexion it is most important to develop a system of economic and social incentives so as to promote adult education and extend proper means of instruction.

42. Among the educational requirements, those referring to the quality of education are not the least important. This is especially true in Latin America where the standards of training are extremely disparate. Apart from formal educational levels, the results of education in real terms should be investigated. High priority should be given to key subjects of a type previously enumerated, and strict standards in the teaching of these subjects should be established and controlled in the schools and at the various training levels.

43. A major educational problem in Latin America is the extremely low educational level of the broad masses. Illiteracy eradication and the raising of the minimum educational level in the region have now become a central objective. Other problems that may be noted relate to the training of an adequate number of persons in appropriate careers. This in turn implies the elimination of surpluses in some professional fields such as law, and increasing the numbers of industrial engineers, technicians, agricultural technicians, highly skilled craftsmen, trained managers and administrative executives, who are at present in short supply.

III. SKILLED MANPOWER PLANNING

44. The essence of manpower planning lies in the mutual adjustment of the current and future availability of manpower of various skill categories with demand as it emerges from the evolution of the economic system or within the framework of targets set by a socio-economic plan. The process of adjustment rests upon a continuing evaluation of the

economic effects of availabilities and shortages of necessary skills. The results of manpower planning, insofar as it deals with skilled labour, would then appear in the following forms: (i) the fixing of targets regarding prospective demand for skilled labour (input targets) and prospective supply of relevant categories of skills (output targets), including time priorities; (ii) the establishment of objectives regarding changes in the technological and organizational patterns of economic activities, compatible with the anticipated availability of skilled personnel; (iii) the fixing of specific measures for meeting manpower output targets. These measures would have to be defined in terms of educational structure, organization of studies, training syllabus, incentives for training, student welfare, vocational guidance and selection, and also in terms of adequate inputs of teaching personnel and training inputs of a material nature (textbooks, workshops, equipment, etc.).

45. With reference to educational inputs, it is very important to note that the demand for teachers results in new educational requirements for the training of the teaching personnel not already available, as well as for replacement purposes. This involves the problem of the time sequence, essential in planning, where the periods needed for the formation of indispensable teaching staff must be taken into account before certain education programmes can operate. This is a further argument for long-range educational planning.

46. The supply of skilled manpower may be augmented by immigration. It is to be recognized, however, that while this source of skilled labour supply is limited, it may be crucial in overcoming specific bottlenecks in certain sectors of the economy. In Latin America the immigration of European skilled labour has been shrinking, and it may be expected that inter-country migratory movements of higher level technicians and perhaps other professions will become increasingly significant in the future. In anticipation of such a development, a co-ordinated approach to the planning of highly skilled manpower within the region would appear to be an important and urgent need.

/47. The

47. The building elements of manpower planning at different levels, understood as an assembly of relevant elementary segments for creating the desired manpower situation within a dynamic economic system, may be identical to those concepts employed in the analysis of manpower structure in section I and the determination of typical educational inputs in section II.

Two fundamental problems arise here: (i) the level of planning, implying the degree of detail, with reference to the educational levels and professional, functional and occupational distribution of the labour force, to be reckoned with in the planning procedure and consequent policy measures; (ii) the planning periods involved in skilled manpower supply-cycles and relevant stages of economic development.

48. The problem of the level of planning requires an objective methodological exposition in order to eliminate confusion. As a general principle, the degree of detail in manpower planning should correspond to the degree of generalization of measures which are necessary for meeting manpower needs. These measures might be divided, in this connexion, into: (i) general measures valid for all manpower categories; (ii) generalized measures valid for various manpower categories belonging to the same level or within the same broad professional field; (iii) specific measures valid for training specific professions or closely related groups of personnel; (iv) very special measures valid for the supply of narrow groups of specialists. All these measures may apply to personal as well as to material training factors.

48. The previous enumeration of measures may be illustrated by the following examples:

(i) Among the "general measures" applicable to all manpower categories might be included those corresponding to the development of primary education, which serves as a basis for all professions. Training facilities, which extend beyond general studies obligatory for the school population as a whole, as for example specialized preparation in the field of agriculture, would be an exception. Such

/measures would

measures would more appropriately fall under category (ii). Secondary education, as a whole, would also fall under the heading of "general measures", but as in the case of primary education more specific measures may be taken. For example, groups of students with special interest in or capacity for science studies could be selected and encouraged to take more advanced courses. The schools would then provide them with special facilities for receiving a higher-than-average level of training in mathematics, physics and other science subjects, thus preparing candidates for higher professional studies in the fields of science and technology. The consideration of these more specialized secondary school facilities are best included in category (ii).

(ii) Covered by the "generalized measures" defined in this category are those pertaining to the creation of professional educational institutions providing the framework within which specialized faculties might be established. It would comprise the provision of training space and all-purpose facilities, and the supply of the staff for teaching general subjects, which are preparatory for later specialization.

(iii) Examples of "specific measures" are to be found in the preparation of the teaching staff, the establishment of laboratories and other specialized training facilities, and the provision of materials necessary for the teaching programme in specific professions. Excluded, however, would be the preparation of highly specialized instructors and laboratories exclusively devoted to the training of a limited category of specialists. The latter are examples rather of "very special measures" would be included in category (iv).

50. The level of skilled manpower planning should also as a general rule correspond to that of economic development planning which it is designed to serve. For example, global economic development planning implies demographic and general manpower planning by broad sectors of activity while economic planning by sectors implies skilled manpower planning by main categories that are relevant for the sectors involved. Economic planning, at the level of specific branches of activity, imposes in turn

certain requirements upon skilled manpower planning. The latter has to take into account the relevant major professions and even in some cases main professional specializations in which shortages are likely to produce serious bottlenecks. Economic development planning in practice starts from the top down, and does not call for the same degree of detail in each and every sector. Key sectors are worked out at greater detail, while less important ones are usually treated more superficially. A similar procedure is used in general and skilled manpower planning.

51. The skilled manpower planning periods corresponding to those of economic planning should also be related to the length of the specific training cycles involved in the formation of skilled manpower. The total length of education and training for any profession, starting with primary education, usually covers a period of a decade or more and sometimes extends to as much as two full decades. Specific training cycles, on the other hand, are shorter, covering a period varying from several months to five or six years. These time characteristics of the process of skilled manpower supply must be taken into account in choosing the period for projections of future utilization of specific skills. Typical lengths of the consecutive stages in training for the main level categories of skilled personnel may be seen in Chart I, above.

52. The length of the periods of educational planning, besides economic and social considerations on the demand side, should in general be determined according to:

(i) the nature and length of training cycles;

(ii) the magnitude of the training task involved as indicated by the numbers and level of preparation of trainees, the amount of investment in educational buildings and equipment, the degree of complexity of laboratories and research facilities;

(iii) the periods required for the preparation of teaching material and staff.

/In Latin

In Latin America, where the shortage of skilled instructional staff and teaching space is notorious, the latter point is of great importance.

53. Corresponding to the length of education and training cycles, a distinction should be made between long-term, medium and short-term skilled manpower planning as is done in economic planning. The long-term would correspond to around ten or more years; the medium-term would correspond to periods of more than two years and below ten years; while the short-term would correspond to periods up to two or three years.

54. The average length of the training periods should not lead to the erroneous conclusion that in the short run the possibilities of implementation of manpower planning are very limited. The adaptability of manpower endowed with an initial training means that through retraining schemes, up-grading and accelerated training for new functions and occupations, very great cumulative improvements in the skilled manpower structure may be obtained, and that they may be achieved within relatively short periods of time.

55. Since short-term planning is normally the most specific and based on the greatest degree of detail, it requires methods of manpower analysis involving a considerable degree of precision. This emphasizes the need for a system of accurate and rapid collection of relevant economic and manpower information.

56. The analysis and projection of skilled manpower must take into account actual and desired relationships between specific categories of manpower, on the one hand, and all those factors which impinge upon the demand and supply of qualified labour, on the other. Some of these factors - acting independently or jointly - exert a general influence upon skilled manpower demand, while others are more specific in their impact.

57. The general factors influencing the employment of skilled manpower may be summarized as follows:

(a) Demographic (population numbers, age distribution, settlement pattern, state of health, etc.)

/(b) Those

(b) Those related to the labour force (total number, distribution by activities, etc.).

(c) General institutional factors (political and administrative structure, size and organization of various public services).

(d) Institutional factors of an economic nature (land use and ownership pattern, size and type of enterprise and establishments).

(e) Institutional factors of a social and socio-economic nature (customary forms of performing personal and other services, organization of producers, and other economic organizations, laboral organizations, etc.).

(f) Natural factors (geographic extension of the country, agricultural area, forest area, mineral deposits suitable for exploitation, hydrographic systems and maritime resources, etc.), while the more specific factors may be of the following types:

(g) Actual level of activities or groups of activities and the corresponding targets.

(h) Actual endowment of fixed capital and corresponding targets and policies.

(i) Industrial location.

(j) Production technologies and type of equipment, actual and prospective.

(k) Actual organization and technical operations of production and anticipated changes.

(l) Actual organization of distribution and related operations and anticipated changes.

(m) "Research and product development" activities at present and planned in the future.

It is perhaps a combination of these factors rather than their separate influence which is most relevant.

58. It is to be noted that within economic planning, specially over the short-term, there is a mutual interaction between the situation in

/respect of

respect of manpower and the distribution of economic resources among various development projects. The latter covers industrial location and the structural patterns to be recommended, as well as the alternative technologies that will be selected. Thus the quantitative and qualitative manpower situation both influences and is in turn influenced by the factors enumerated, particularly those mentioned under (d), (e), (h), (i), (j), (k), and (l). Continuous readjustments between the economic and the manpower training targets would therefore have to be contemplated throughout the process of manpower planning.

59. From the above it may be concluded that the number and variety of independent factors involved in the determination of needs for skilled personnel makes it imperative to seek a simplified approach to the problem without, however, falling into an over-simplification. In general, two basic approaches can be distinguished: the macro-economic and the micro-economic approach, which may be used separately or in a complementary way.

60. The macro-economic approach, which might be termed the "macro-occupational" approach, would consist of determining the actual or the proposed input-coefficient of some (usually broad) categories of manpower, in relation to the numerical data, corresponding to the selected factors of the more general type that are considered as most relevant in this connexion.

The practical work would therefore comprise :

(i) determining the professional groups or other manpower categories to be taken into account in the given case;

(ii) establishing the main determinants of the inputs of these groups, in the form of selecting the factors that actually are interconnected or should become closely related;

(iii) determining the manner of numerical evaluation of these factors;

(iv) determining the type of quantitative relationship that should be used to link (i) and (iii) ;

/(v) calculating

(v) calculating the actual coefficients and estimating the corresponding future coefficients.

61. With reference to the latter point, the "historical method", basing projections on long-term trends, or the "comparison method" basing projections upon comparisons with other countries, are both useful, from the practical point of view. It is to be added, however, that the "historical method" may be valid with reference to traditional activities in given countries, in which intra-sectoral changes may proceed rather slowly, while for the new branches of activity the "comparison method" is indicated. When using the "comparison method" for projections of certain categories of skilled manpower, the comparison should preferably be made between the country under consideration and another country whose stage of development would roughly correspond to the level that the given country is expected to reach within the period indicated in the projections.

62. In the construction of macro-occupational models the first step should consist of presenting the actual situation, that to be aimed at under present conditions, and a specific desired future situation for the employed labour force as a whole, subdivided into broad categories only. The techniques used in general employment projections should take into account the main factors that determine the labour absorption capacity of individual branches of activity. The latter may in turn be classified into three broad groups according to the dominant influence exerted by one of the following factor types: (a) technological factors; (b) institutional factors; (c) price-and-income elasticities of demand for goods and services, and the wage elasticity of labour supply. It will be seen that the analysis of the employment of skilled manpower in the sectors which are predominantly influenced by one of the three indicated groups of factors would to that extent follow a different pattern.

63. Throughout the planning process the target-setting operation must be complemented by institutional planning, i.e. the planning of substantial changes in the whole institutional framework of the given sector or branch of activity, or the planning of the development of

new institutional forms auxiliary to the fulfilment of production targets. New types of coefficients of necessary inputs of skilled manpower, relating to the proposed new setting, should be developed. The rational fixing of such coefficients may be based only partially on past or present experience, or calculated roughly in an abstract way. Data derived from micro-occupational analysis could be usefully employed in this connexion.

64. In short, the fundamental point of discussion in connexion with the practical procedures in manpower planning at the macro-economic level, consists of:

(a) an adequate classification of economic activities, which in practice would have to be that utilized in economic analysis and planning;

(b) expressing the estimates of the required skilled labour force by means of a classification system, to be used in determining the necessary investment in educational, professional and vocational training. It is to be understood that this classification would depend on the structure of the system of training of the working force. In some practical applications of manpower planning techniques, very simple procedures were utilized in determining educational requirements. Estimates of demand for a very limited number of categories of skilled manpower were made, along with the specification of the necessary number of years of training. It is also necessary to point out that in this field of planning, in the same way as in economic planning in general, the practical method consists of proceeding by stages up to certain grades of detail, taking into account the various factors which impinge upon both the demand and the training of personnel. In this way a certain degree of complementarity exists between what is called here the macro and the micro-occupational approach.

65. The micro-economic approach, or what in manpower analysis might be termed the "micro-occupational" approach, could also be employed. It would consist of a detailed analysis of the occupational composition: (i) within

/individual establishments

individual establishments or public institutions, or both; (ii) within the framework of a specially selected productive organization covering certain production lines; (iii) the whole establishment or enterprise; (iv) or even within a specific sector of economic activity within a geographical segment of the country.

The contents and the specific methods of micro-economic analysis would have to take into account, at least, the following factors:

(a) the economic and technological processes involved;
(b) technologies and type of equipment utilized;
(c) organization of productive processes;
(d) organization of non-productive processes;
(e) administrative structure;
(f) specific production characteristics, including the volume and quality of the product;
(g) the value added arising from the production processes.

The relationship of such factors to the employment of skilled personnel would be the subject of investigation.

66. Micro-occupational models derived from such an analysis could then be used either as samples or, where it is possible to calculate input coefficients for relevant categories of personnel, might be employed in the macro-occupational models previously discussed. They might also be used directly for skilled manpower planning purposes in some sectors of economic activity, for example where the complexity of actors in the productive process and high capital-intensity justify the use of exact computational techniques. It is to be noted, however, that the organization of economic information must be sufficiently developed so as to enable the efficient use of micro-occupational development models.

67. The calculation of input-coefficients of specific categories of skilled manpower, through macro-occupational or micro-occupational analysis for an activity "X", contributes towards defining the current and future labour-force patterns. This may be defined by utilizing the concepts of the level and shape of the labour-force profile, and of its general and specific

professional patterns. The input-coefficients in this connexion should be treated not as exact figures but rather as averages, with a degree of deviation, which will vary from one activity to another.

68. Skilled manpower planning may also be conceived as a form of functional planning, that is, a series of projections of manpower requirements according to typical functions performed within economic sectors or branches of economic activity. For this purpose the functions enumerated in point 16 above may be regrouped to form a reduced number, as is indicated in the hypothetical example set out in table 1. The exact number of functional categories employed in the analysis of each sector or branch of economic activity will vary in accordance with their degree of relevance to the specified type of activity. Each functional category may then be defined in terms of professional and vocational training requirements at various levels of detail. In some cases, rather than an exact specification of training levels, it may be sufficient for planning purposes to simply indicate the desired education and training profile. The adaptation of the procedures described to specific occupations within the sector or branch of economic activity would become less important to the extent that the factors of flexibility, namely, the average level, the shape and the composition of the labour force training profile, are present to a high degree. Overall balances of educational and training needs may be derived by aggregating the manpower matrices (as illustrated in table 1) of individual branches of economic activity and of broader economic sectors.

69. Economic evaluation of the skilled manpower situation is possible through the analysis of the relationship of skilled manpower to all other economic factors, to which skilled manpower is complementary. These complementary aspects are more or less irrelevant in marginal cases of activities which are of low capital-intensity and simply organized, in which skilled labour represents the principal input. The complementary aspects become significant in highly organized activities with high capital-intensity and which utilize complex technologies.

/Table 1

Table 1

HYPOTHETICAL EXAMPLE OF THE RELATIONSHIP BETWEEN TYPICAL MANPOWER FUNCTIONS AND TRAINING LEVELS, FOR AN ECONOMIC SECTOR OR BRANCH OF ACTIVITY

Broad category or function performed by or in:	Training level					
	A	B	C	D	E	F
1. Management and high administration	A	B	-	-	-	-
2. Functions performed by higher level professionals a/	A	B	-	-	-	-
3. Clerical and related functions	-	B	C	D	-	-
4. Independent producers or sellers b/ (except those belonging to categories 1 and 2)	-	B	C	D	E	-
5. Craftsmen and expert workers (except those belonging to category 4)	-	-	C	-	-	-
6. Equipment operators	-	-	C	D	E	-
7. Skilled process operatives	-	-	-	D	-	-
8. Semi-skilled process operatives and other auxiliary workers	-	-	-	-	E	-
9. Personal servicing	-	-	-	D	E	-
10. Miscellaneous functions, other than professional including those performed by unskilled labour	-	-	-	D	E	F
Sum of training requirements by main level	$\sum A$	$\sum B$	$\sum C$	$\sum D$	$\sum E$	$\sum F$

a/ Including research and development designing and drafting; inspection and laboratory service; construction, installation, production, operation, maintenance performed at a high technical level; technical supervision; individual professional practice and consulting.

b/ Including directly or manually performed technical functions that may refer to construction, installation, production, operation, or maintenance, combined with managerial and commercial functions involved in such operations. Commercial and managerial functions may also appear separately from technical functions.

/70. In

70. In the highly organized and capital-intensive activities, the full coverage of skilled manpower necessities corresponding to all levels and all professions (which means an optimum manpower composition) may result only from the best use of other production factors, leading to maximum efficiency. The shortages of certain skills or their defective quality leads to the lowering of over-all efficiency in the use of available resources, up to the point of reaching the breakdown of certain processes, which cannot be carried on without a given minimum supply of critical skills. Otherwise, skilled manpower shortages of definite types in the highly complex activities result in the falling of productivity up to the point of becoming major production bottlenecks, either directly in the given activity or enterprise or in other activities. Thus, skilled manpower shortcomings whether in terms of quantity or quality represent real economic losses for individual production or administrative units as well as for the economy as a whole.

71. A further element of economic evaluation of the skilled manpower situation would be provided by the analysis of the influence of the educational levels and of the availability of special skills that are necessary for the securing of a desired rate of progress in the fields of technology, organization and institutional improvements, and of social development of the kind that is of significance to economic growth.

72. The problem of evaluating the productivity of skilled manpower is a subject of profound theoretical and practical interest and is intimately related to the problem of productivity of investment in the education and training of skilled manpower. On one side of the scale is the personal and social cost of education and tr ining, while on the other side there are economic returns for the individuals and enterprises involved, and for the community as a whole, i.e. the social returns. The study of these relationships is an important subject of economic theory and of the theory of the economics of education, interest in which has greatly increased during the last few years.

IV. THE MECHANISM OF MANPOWER PLANNING

73. There is a vital necessity to develop the mechanism for manpower planning in order to integrate it into the general pattern of economic and social planning. In practice, the problem consists of securing proper co-ordination of all efforts of analysis and planning in the social field, economics, education, manpower in general and skilled manpower in particular, according to the specific conditions of each country.

74. The principal manpower planning aspects would correspond to the scope of the planning of human resources. In this connexion ECLA resolution 206 (IX) proposes an "integral evaluation of human resources in the economy".

75. The efficient application of manpower planning and policies rests, to a large extent, upon the ready availability of accurate economic information. It is therefore of utmost importance that consideration be given to the development of the efficient organization of economic information and designed so as to complement the mechanism of economic and manpower planning.